a source of an electrical detection signal representative of an electromagnetic field produced by a lightning discharge;

an analog-to-digital converter, responsive to said electrical detection signal, for producing a digital detection signal;

a digital processor for determining the type of lightning discharge that produced said electromagnetic field based on characteristics of said digital detection signal, said digital processor producing digital data characterizing lightning discharges that are identified;

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a data compression component for reducing the amount of data needed to characterize a lightning discharge so as to decrease the time or bandwidth required to transmit data representative of a series of lightning discharges; and

a data transmission component for transmitting said characterizing data over a communications channel.

62. The lightning detection system of claim 61, wherein both said digital processor and said data compression component comprise a programmed digital processor.

63. The lightning detection system of claim 61, wherein said data compression component produces, as data representative of said series of lightning discharges, data representative of the amplitude and data representative of the time of occurrence of the largest amplitude discharge in said series of lightning discharges.

64. The lightning detection system of claim 63, wherein said data compression component further produces, for one or more additional lightning discharges in said series of discharges, data representative of the time of occurrence of each said additional discharge with respect to the time of an adjacent discharge.

65. The lightning detection system of clam 64, wherein said data compression component further produces, for said one or more additional discharges in said series of discharges, data representative of the relative amplitude of each said additional discharge with respect to the amplitude of said largest amplitude discharge.

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66. The lightning detection system of claim 65, wherein said data compression component further comprises a data decimation component for synchronously decimating said characterizing data when needed to accommodate the bandwidth of said communications channel.

67. The lightning detection system of claim 66, wherein said data decimation component comprises a component for determining whether the rate of electrical detection signals produced by said source in response to said series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data representing those electrical detection signals that occur during a periodically occurring time frame of predetermined length.

68. The lightning detection system of claim 61, further comprising a data decimation component for synchronously decimating said characterizing data when needed to accommodate the bandwidth of said communications channel.

69. The lightning detection system of claim 68, wherein said data decimation component comprises a component for determining whether the rate of electrical detection signals produced by said source in response to said series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data representing those electrical detection signals that occur during a periodically occurring time frame of predetermined length.

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70. The lightning detection system of claim 61, wherein a plurality of said sources of data include respective sources of an electrical detection signals, analog-to-digital converters, digital processors, data compression components and data transmission components.

71. The lightning detection system of claim 70, wherein said sets of data are correlated in time.

72. The lightning detection system of claim 71, wherein two distinct pairs of three said sets of data are operated on by a correlation operator, the time shift corresponding to the peak correlation value is taken to be the difference in propagation time from a given discharge to the

respective sensors which serve as respective sources whose data is correlated, and the two time differences thus found are used to estimate the location of a discharge.

73. The lightning detection system of claim 71, wherein three said sets of data from respective sources are first compared to identify the data corresponding to the highest amplitude discharge represented in each set, the time differences between two distinct pairs of said data representing the highest amplitude discharge is taken to be the difference in propagation time from the highest amplitude discharge to the respective sensors, which serve as respective sources whose data is correlated, and the two time differences thus found are used to estimate the location of the said highest amplitude discharge.

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74. The lightning detection system of claim 73, wherein said sets of data are shifted in the time domain so that data representing said highest amplitude discharge in each said set of data are coincident, and the corresponding time interval between adjacent discharges are compared for each set of data to estimate the reliability of the correlation.

75. The lightning detection system of claim 74, wherein said correlation is accepted as reliable where at least one corresponding said time interval from among all said sources agrees to within a predetermined maximum value.

76. The lightning detection system of claim 75, wherein said central analyzer further includes an optimization component which, when said data sets comprise redundant information

regarding the location or time of occurrence of a discharge, applies an optimization algorithm to determine the optimum time and location pair.

77. The lightning detection system of claim 76, wherein said optimization algorithm employs a least-squares estimation of the optimum time and location pair based on propagation time data from at least four sensors which serve as respective sources.

78. The lightning detection system of claim 70, wherein when said characterizing data includes information about the angle relative to two sensors which serve as respective sources with respect to a discharge, and the location of said discharge is initially determined from said angles.

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79. The lightning detection system of claim 78, wherein the arrival times of said discharge whose location is determined by said angles at a plurality of sensors which serve as respective sources are estimated from said location, said sets of data from said plurality of sensors are shifted in the time domain by relative differences in said arrival times, and the corresponding time intervals between adjacent discharges are compared for each set of data to estimate the reliability of said correlation.

80. The lightning detection system of claim 79, wherein said correlation is accepted as reliable where at least one corresponding said time interval for all said sensors agrees to within a predetermined maximum value.

81. The lightning detection system of claim 24 wherein at least one of said sources of data representative of a series of lightning discharges comprises:

an antenna for producing, in response to an electromagnetic field produced by a lightning discharge, an electrical detection signal representative of said field;

an analog-to-digital converter, responsive to said electrical detection signal, for producing a digital detection signal;

a digital processor for determining the type of lightning discharge that produced said electromagnetic field based on characteristics of said digital detection signal, said digital processor producing digital data characterizing lightning discharges that are identified;

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a data decimation component for synchronously decimating said characterizing data to reduce the data for transmission; and

a data transmission component for transmitting said decimated characterizing data over a communications channel.

82. The lightning detection system of claim 81, wherein both said digital processor and said data decimation component comprise a programmed digital processor.

83. The lightning detection system of claim 82, wherein said data decimation component comprises a component for determining whether the rate of electrical detection signals produced by said antenna in response to a series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data

representing those discharges' electrical detection signals that occur during a periodically occurring time frame of predetermined length.

84. The lightning detection system of claim 29, wherein said central analyzer further includes an optimization component which, when said data sets comprise redundant information regarding the location or time of occurrence of a discharge, applies an optimization algorithm to determine the optimum time and location pair.

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85. The lightning detection system of claim 84, wherein said optimization algorithm employs a least-squares estimation of the optimum time and location pair based on propagation time data from at least four sensors which serve as respective sources.

86. The lightning detection method of claim 52 wherein providing a plurality of sources of data representative of a series of lighting discharges comprises, for at least one of said sources:

producing in response to an electromagnetic field produced by a lightning discharge an electrical detection signal representative of said electromagnetic field;

producing a digital detection signal representative of said electrical detection signal;

determining the type of lightning discharge that produced said electromagnetic field based on characteristics of said digital detection signal and producing digital data characterizing lightning discharges that are so determined;

reducing the amount of data needed to characterize a lightning discharge so as to decrease the time or bandwidth required to transmit data representative of a series of lightning discharges; and

transmitting said characterizing data over a communications channel.

87. The method of claim 86, wherein said reducing step produces data representative of the amplitude and data representative of the time of occurrence of the largest amplitude discharge in said series of lightning discharges.

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88. The method of claim 87, wherein said reducing step further produces, for one or more additional lightning discharges in said series of discharges, data representative of the time of occurrence of each said additional discharge with respect to the time of occurrence of an adjacent discharge.

89. The method of claim 88, wherein said reducing step further produces, for said one or more additional discharges in said series of discharges, data representative of the relative amplitude of each said additional discharge with respect to the amplitude of said largest amplitude discharge.

90. The method of claim 89, wherein said reducing step further comprises synchronously decimating said characterizing data as needed to accommodate the bandwidth of said communications channel.

91. The method of claim 90, wherein said decimating step comprises determining whether the rate of electrical detection signals produced in response to said series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data representing those electrical detection signals that occur during a periodically occurring time frame of predetermined length.

92. The method of claim 86, further comprising synchronously decimating said characterizing data as needed to accommodate the bandwidth of said communications channel.

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93. The method of claim 92, wherein said decimating step further comprises determining whether the rate of electrical detection signal produced in response to said series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data representing those discharges that occur during a periodically occurring time frame of predetermined length.

94. The method of claim 86, wherein providing a plurality of sources of data comprises providing a plurality of electrical detection signals representative of an electromagnetic field from a lightning discharge and, for each said electrical detection signal, producing a digital detection signal, determining the type of lightning discharge that produced said electromagnetic field based on characteristics of said digital detection signal, producing digital data characterizing lightning discharges that are so determined, reducing the amount of data needed to characterize a lightning discharge so as to decrease the time or bandwidth required to transmit

data representative of a series of lightning discharges, and transmitting said characterizing data over a communications channel to said central location.

95. The method of claim 94, wherein said sets of data are correlated in time.

96. The method of claim 95, wherein two distinct pairs of three said sets of data are operated on by a correlation operator, the time shift corresponding to the peak correlation value is taken to be the difference in propagation time from a given discharge to the respective sensors which serve as respective sources whose data is correlated, and the two propagation time differences thus found are used to estimate the location of a discharge.

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97. The method of claim 95, wherein three said sets of data are first compared to identify the data corresponding to the highest amplitude discharge represented in each set, the time differences between two distinct pairs of said data representing the highest amplitude discharge is taken to be the difference in propagation time from the highest amplitude discharge to the respective sensors which serve as respective sources whose data is correlated, and the two propagation time differences thus found are used to estimate the location of the said highest amplitude discharge.

98. The method of claim 97, wherein said sets of data are shifted in the time domain so that data representing said highest amplitude discharge in each said set of data are coincident, and the

corresponding time intervals between adjacent discharges are compared for each set of data to estimate the reliability of the correlation.

99. The method of claim 98, wherein the correlation is accepted as reliable where at least one corresponding said time interval from among all said sensors agrees to within a predetermined maximum value.

100. The method of claim 94, wherein when said characterizing data includes information about the angle relative to two sensors which serve as respective sources with respect to a discharge, the location of said discharge is initially determined from said angles.

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101. The method of claim 100, wherein the arrival times of said electromagnetic field produced by said discharge whose location is determined by said angles at a plurality of sensors which serve as respective sources are estimated from said location, said sets of data from said plurality of sensors which serve as respective sources are shifted in the time domain by relative differences in said arrival times, and the corresponding time intervals between adjacent discharges are compared for each set of data to estimate the reliability of the correlation value.

102. The method claim 101, wherein the correlation is accepted as reliable where at least one corresponding said time interval for all said sensors agree to within a predetermined maximum value.

103. The lightning detection method of claim 52 wherein providing a plurality of sources of data representative of a series of lightning discharges comprises, for at least one of said sources:

producing in response to an electromagnetic field produced by a lightning discharge, an electrical detection signal representative of said field;

producing a digital detection signal responsive to said electrical detection signal;

determining the type of lightning discharge that produced said electromagnetic field based on characteristics of said digital detection signal and producing digital data characterizing lightning discharges that are identified;

synchronously decimating said characterizing data to reduce the data for transmission; and

transmitting said decimated characterizing data over a communications channel.

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104. The method of claim 103, wherein said data decimating step comprises determining whether the rate electrical detection signals produced in response to a series of lightning discharges exceeds the data transmission capacity of said communications channel and, in that event, selecting for transmission only data representing those electrical detection signals that occur during a periodically occurring time frame of predetermined length.

105. The method of claim 86, wherein said correlating sets of data further includes determining the optimum time and location pair when said data sets comprise redundant information regarding the location or time of occurrence of a discharge.

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106. The method of claim 105, wherein said optimizing employs a least-squares estimation of the optimum time and location pair based on propagation time data from at least four sources of data representative of a series of lightning discharges.